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AN AS-1 PROGRAM TO COMPUTE ATTENUATION COEFFICIENTS ON THE UNIV--ETC(U)
JAN 70 R B MACDONALD F/6 17/1

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NAVY UNDERWATER SOUND LABORATORY
NEW LONDON, CONNECTICUT 06320

AN AS-1 PROGRAM TO COMPUTE ATTENUATION COEFFICIENTS
ON THE UNIVAC 1230 COMPUTER

NUSL Problem No.
0-A-401-00-00
SF 11 552 001-11282

by

R. B. MacDonald

NUSL Technical Memorandum No. 2211-10-70

16 Jan 1970

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INTRODUCTION

The program is called "ATTENLOSS" and assumes a table (RANGE) is filled in core with values of range and propagation loss in sets of two. The program then works on this table to calculate the attenuation coefficient (COEFF), the transitional range (INTERCEPT), a table of ranges (RANGE 1), and a table of adjusted propagation loss (ADJPRO). Additionally, the standard error of estimate (SEE) and the standard error of the regression coefficient (SERC) are calculated.

MATH MODEL

The equations in this program are essentially derived from the propagation loss equation of the following form:

$$PL - 10 \log R = \alpha R + H_0$$

where: PL = propagation loss in DB.

R = range in yards.

$H_0 = 10 \log R_0$ = the transitional range in DB or the point at which cylindrical rather than spherical spreading becomes the dominant loss mode.

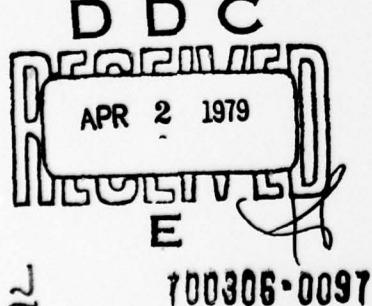
α = attenuation coefficient in DB/yard.

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The loss equation written in the above fashion is simply the equation for a straight line where $Y = PL - 10 \log R$, the adjusted propagation loss (ADJPRO), and $X = R$, the range. The transitional range H_0 is simply the Y intercept and α , which is the attenuation coefficient, is the slope of the line. The solution for α can then be written as:

$$\alpha = \frac{n \sum XY - \sum X \sum Y}{n(\sum x^2) - (\sum x)^2} \text{ in DB/yard}$$

where n = number of data points

Similarly:

$$H_0 = \frac{(\sum x^2) \sum Y - \sum X \sum XY}{n(\sum x^2) - (\sum x)^2} \text{ in DB}$$

An estimate of the "goodness of fit" of the data points to a straight line approximation may be made by calculating the standard error of estimate of the data points about the straight line which is given by:

$$SEE = \sqrt{\frac{\sum (\alpha R + H_0 - PL + 10 \log R)^2}{n-2}} \text{ in DB}$$

and the standard error of the regression coefficient, which tests the variability of the attenuation coefficient, and is given by:

$$SERC = \frac{SEE}{\sqrt{R^2}} \text{ in DB}$$

MATH DEVELOPMENT

The following statements list the solutions to the above equations in the manner in which they are solved in the program.

- 1) ΣR
- 2) ΣR^2
- 3) $10 \log R$
- 4) $PL - 10 \log R$
- 5) $R(PL - 10 \log R)$
- 6) $\Sigma R(PL - 10 \log R)$
- ADJPRO 7) $PL - 10 \log R$
- 8) $\Sigma(PL - 10 \log R)$

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- 9) $(\sum R)^2$
- 10) $n(\sum R^2)$
- 11) $n(\sum R^2) - (\sum R)^2$
- 12) $\sum R \sum (PL - 10 \log R)$
- 13) $n \sum R (PL - 10 \log R)$
- 14) $n \sum R (PL - 10 \log R) - \sum R \sum (PL - 10 \log R)$
- COEFF 15) $n \sum R (PL - 10 \log R) - \sum R \sum (PL - 10 \log R) / n(\sum R^2) - (\sum R)^2$
- 16) $\sum R \sum R (PL - 10 \log R)$
- 17) $\sum R^2 \sum (PL - 10 \log R)$
- 18) $\sum R^2 \sum (PL - 10 \log R) - \sum R \sum R (PL - 10 \log R)$
- INTERCEPT 19) $\sum R^2 \sum (PL - 10 \log R) - \sum R \sum R (PL - 10 \log R) / n(\sum R^2) - (\sum R)^2$
- 20) αR
- 21) $\alpha R + H_0$
- 22) $\alpha R + H_0 - PL + 10 \log R$
- 23) $(\alpha R + H_0 - PL + 10 \log R)^2$
- 24) $\sum (\alpha R + H_0 - PL + 10 \log R)^2$
- 25) $\sum (\alpha R + H_0 - PL + 10 \log R)^2 / n - 2$
- SEE 26) $\sqrt{\sum (\alpha R + H_0 - PL + 10 \log R)^2 / n - 2}$
- 27) $\sqrt{\sum R^2}$
- SERC 28) $SEE / \sqrt{\sum R^2}$

PROGRAM INPUTS

The program computes only one coefficient per pass or one frequency at a time. An area of core called "RANGE" must be set aside and filled in the following manner:

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Table "RANGE"

Cell 1 Range (1) in hundreds of yards, scaled 0 bits
Cell 2 Propagation Loss (1) in DB, scaled 3 bits
Cell 3 Range (2)
Cell 4 Propagation Loss (2)
Cell 5 Range (3) etc.

The range and propagation loss sets do not have to be in any particular order and the range may be either positive or negative, indicating an opening or closing run. The total number of cells used for Table "RANGE" is set into cell "LIMIT", scaled 0 bits.

PROGRAM OUTPUTS

The following are program outputs (which remain in core):

COEFF = Attenuation coefficient in DB, scaled 15D bits.
INTERCEPT = Transitional range in DB, scaled 9D bits.
SEE = Standard error of estimate in DB, scaled 9D bits.
SERC = Standard error of the regression coefficient in DB/unit range, scaled 9D bits.

Table ADJPRO, adjusted propagation loss and range in the following form:

Cell 1 Range (1) in kyds, scaled 3 bits
Cell 2 PL -10log R(1) in DB, scaled 3 bits
Cell 3 Range (2)
Cell 4 PL -10log R(2)
Cell 5 Range (3) etc.

OPERATING INSTRUCTIONS

- 1) Load Table "RANGE"
- 2) Set "LIMIT" to number of values in table "RANGE"
- 3) RJP * ATTEMLOSS

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OTHER PROGRAMS REQUIRED FOR COMPIRATION

CONLOGIT - Decibel conversion routine

FLPARITH - Floating point package

CORE REQUIREMENTS

214_{10} cells for ATTEMLOSS minus tables

96_{10} cells for CONLOGIT

650_{10} cells for FLPARITH

 960_{10} Total cells

COGNIZANT SCIENTIST

W. Thorp, Code 2211.2

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ROBERT B. MACDONALD
Physicist

Definition of Terms

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1. RANGE1 - Table - Range values in kiloyards, scaled 3 bits.
2. QSUMR2 - Variable - Q register portion of floating point number for ΣR^2 .
3. ASUMR2 - Variable - A register portion of floating point number for ΣR^2 .
4. RANGE - Table - Range-propagation loss values. Range in hundreds of yards, propagation loss in DB. Range, unscaled; PL, scaled 3 bits.
5. SUMR - Variable - Sum of range values in kyds., scaled 3 bits.
6. LIMIT - Variable - Total number of values to be processed (range plus propagation loss), scaled 0 bits.
7. NOP - Variable - Holds count of total number of values processed, scaled 0 bits.
8. MTEMP - Variable - Temporary storage.
9. ASUMRNW - Variable - A register portion of floating point quantity for $\Sigma R(PL - 10 \log R)$.
10. QSUMRNW - Variable - Q register portion of floating point quantity for $\Sigma R(PL - 10 \log R)$.
11. ADJPRO - Table - Adjusted propagation loss ($PL - 10 \log R$) in DB, scaled 3 bits.
12. NW - Variable - Sum of adjusted propagation loss $\Sigma(PL - 10 \log R)$ in DB, scaled 3 bits.
13. ASUMR - Variable - A register portion of floating point number for $(\Sigma R)^2$.
14. QSUMR - Variable - Q register portion of floating point number for $(\Sigma R)^2$.
15. ADVISOR - Variable - A register portion of floating point number for $n(\Sigma R^2) - (\Sigma R)^2$.
16. QDIVISOR - Variable - Q register portion of floating point number for $n(\Sigma R^2) - (\Sigma R)^2$.
17. ANOP - Variable - A register portion of floating point number for n.
18. QNOP - Variable - Q register portion of floating point number for n.
19. ASUMR1 - Variable - A register portion of floating point number for ΣR .
20. QSUMR1 - Variable - Q register portion of floating point number for ΣR .
21. ASURT - Variable - A register portion of floating point number for $\Sigma R(PL - 10 \log R)$.

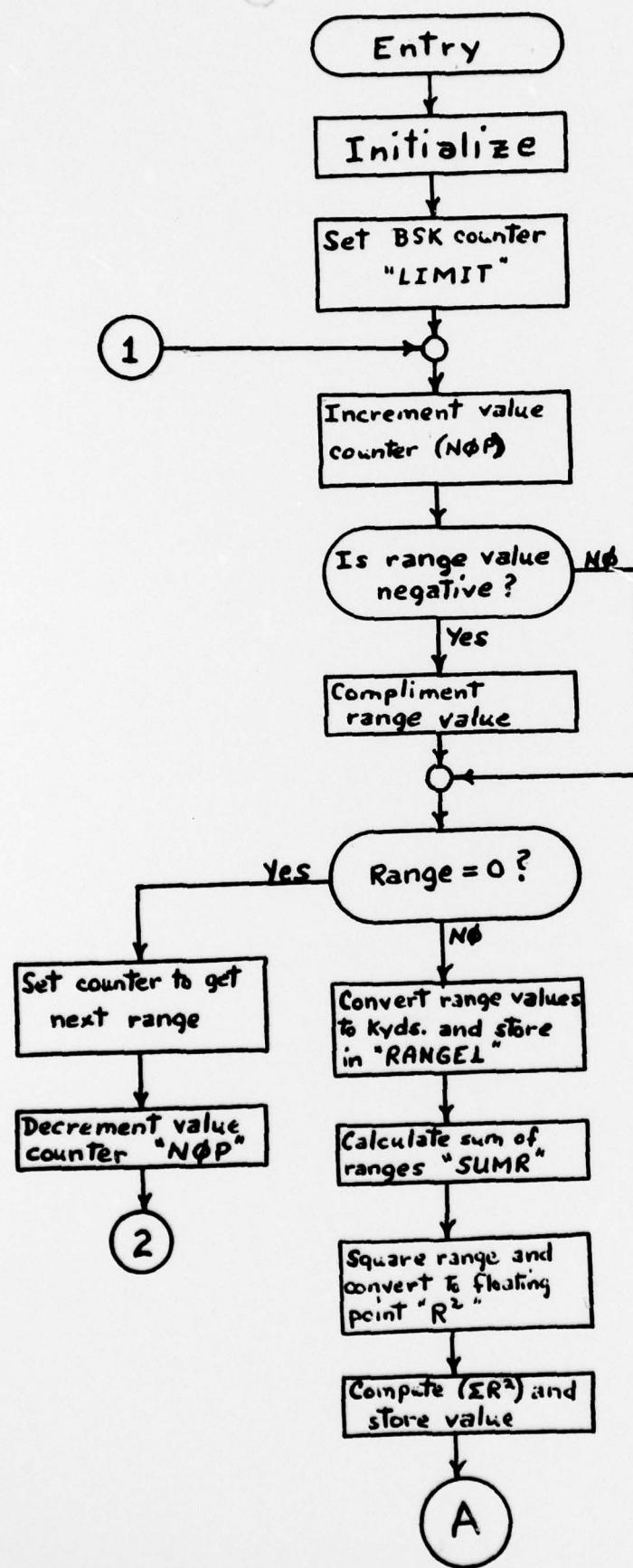
Definition of Terms (cont.)

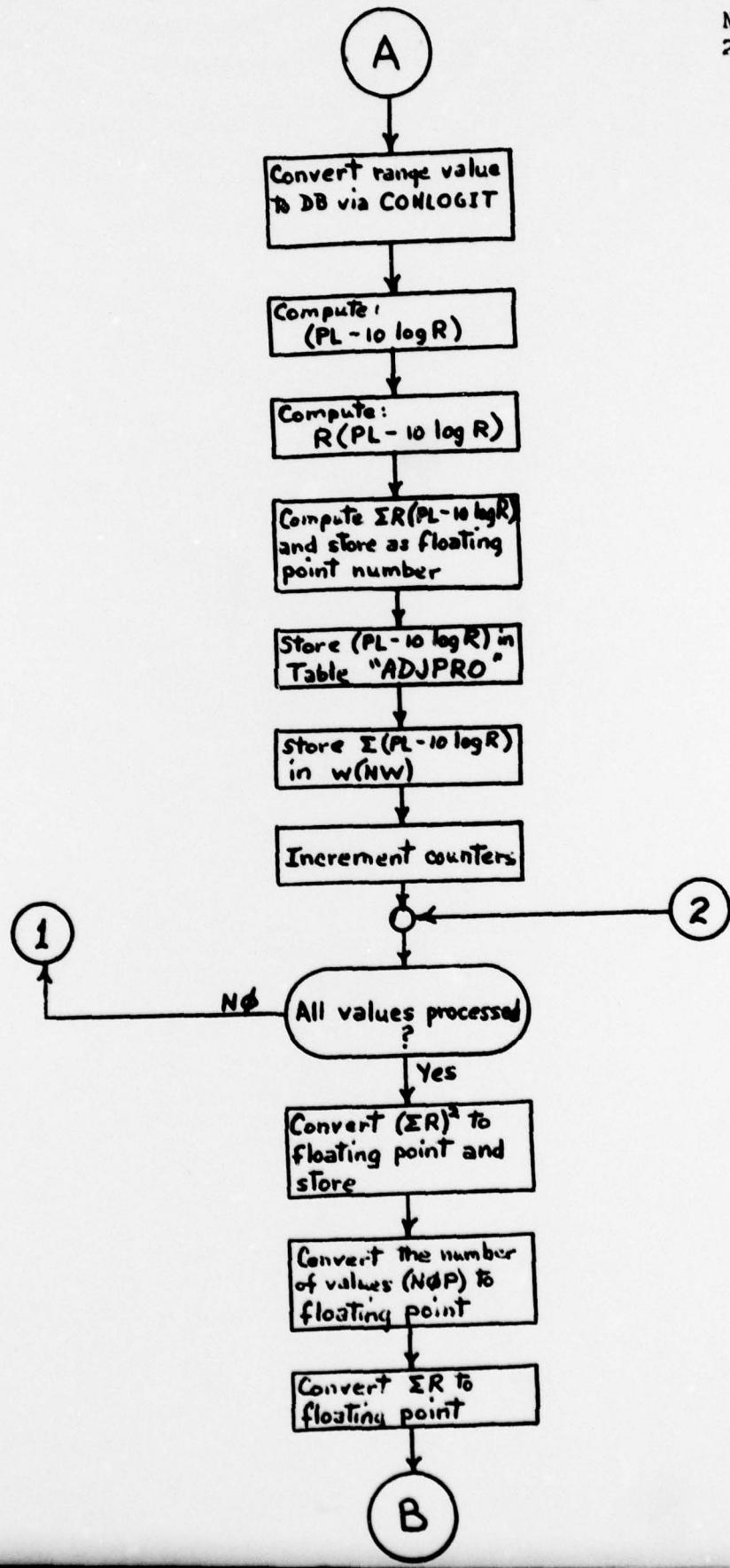
22. QSUBT - Variable - Q register portion of floating point number for $\Sigma R \Sigma (PL - 10 \log R)$.
23. COEFF - Variable - Attenuation coefficient in DB/yd., scaled 15D.
24. QRRNW - Variable - Q register portion of floating point number for $\Sigma R \Sigma R (PL - 10 \log R)$.
25. ARRNW - Variable - A register portion of floating point number for $\Sigma R \Sigma R (PL - 10 \log R)$.
26. INTERCEPT - Variable - Transitional range in DB, scaled 9D.
27. DIF - Variable - $\Sigma (\alpha R + H_0 - PL + 10 \log R)^2$, scaled 3 bits.
28. LIMIT2 - Variable - Total number of range (only) values, scaled 0 bits.
29. SYM - Variable - $\Sigma (\alpha R + H_0 - PL + 10 \log R)^2 / n - 2$, scaled 3 bits.
30. SEE - Variable - Standard error of estimate in DB, scaled 9D.
31. SERC - Variable - Standard error of the regression coefficient in DB/unit range, scaled 9D.

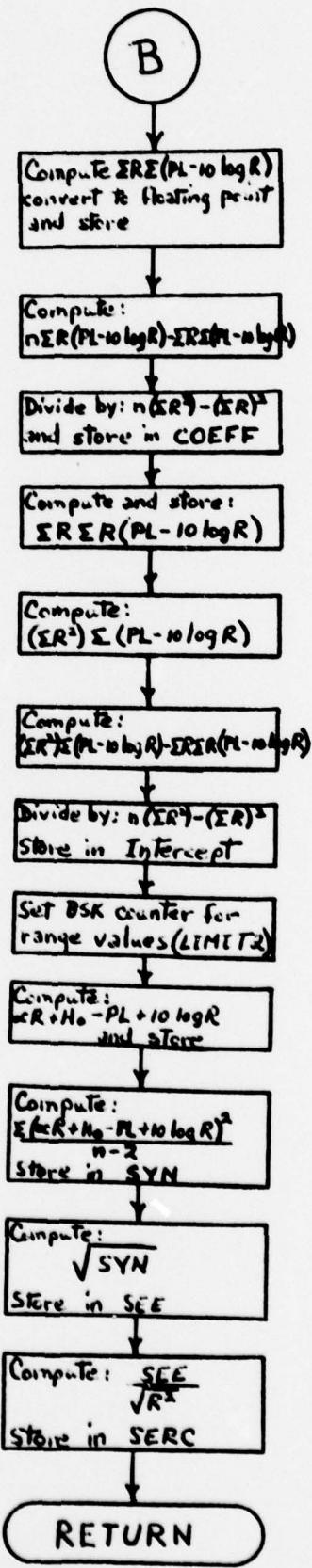
Floating Point Arithmetic Terms (FLPARITH)

1. FLENT - Enter floating point accumulator.
2. FLAD - Floating point add.
3. FLSB - Floating point subtract.
4. FLMP - Floating point multiply.
5. FLDV - Floating point divide.
6. FLSTR - Floating point store.
7. FIXFLT - Fixed point to floating point conversion.
8. FLTIX - Floating point to fixed point conversion.

FLOW DIAGRAM
Program "Attenloss"







ATTNO 0001	C-CONTROL
ATTNO 02	ALLOCATION
ATTNO 03	BASE 20000
ATTNO 04	PROGRAM MACDONALD 6 JANUARY 1969
ATTNO 13	LOC-00
ATTNO 14	VRBL*SUMR*FXW***SUM OF RANGE (YDS) SC 3
ATTNO 15	VRBL*NOP*FXW***NUMBER OF RANGE VALUES
ATTNO 16	VRBL*ASUMR2*FXW***SUM OF RANGE SQUARED A REG. FLT PT
ATTNO 17	VRBL*QSUMR2*FXW***SUM OF RANGE SQUARED Q REG. FLT PT
ATTNO 19	VRBL*ASUMRNW*FXW***SUMR(NW-10LOGR) A REG. FLT PT
ATTNO 20	VRBL*QSUMRNW*FXW***SUMR(NW-10LOGR) Q REG. FLT PT
ATTNO 21	VRBL*NW*FXW***SUM(NW-10LOGR) SC 3
ATTNO 23	VRBL*ASUMR*FXW***SUM RANGE SQUARED A REG. FLT PT
ATTNO 24	VRBL*QSUMR*FXW***SUM RANGE SQUARED Q REG. FLT PT
ATTNO 25	VRBL*ADIVISOR*FXW***NSUMR SQD.- (SUMR) SQD. AREG FLT
ATTNO 026	VRBL*QDIVISOR*FXW***NSUMR SQD.- (SUMR) SQD. QREG FLT
ATTNO 27	VRBL*ANOP*FXW***NUMBER OF POINTS A REG. FLT. PT.
ATTNO 28	VRBL*QANOP*FXW***NUMBER OF POINTS Q REG. FLT. PT.
ATTNO 29	VRBL*ASUBT*FXW***SUMRSUM(NW-10LOGR) A REG. FLT PT
ATTNO 30	VRBL*QSUBT*FXW***SUMRSUM(NW-10LOGR) Q REG. FLT PT
ATTNO 32	VRBL*QRNRNW*FXW***SUMRSUMR(NW-10LOGR) Q REG. FLT PT
ATTNO 33	VRBL*ARKNW*FXW***SUMRSSUMR(NW-10LOGR) A REG. FLT PT
ATTNO 34	VRBL*SYN*FXW***SUM(Y-YHAT)/N-2 SC 9
ATTNO 35	VRBL*DIF*FXW***SUM(NW-10LOGR)A-(AR+H)P SC 6
ATTNO 36	VRBL*COEFF*FXW***ATTEN COEFF(DB/YD) SC 15D
ATTNO 37	VRBL*INTERCEPT*FXW***TRANSITION RANGE(DB) SC 9
ATTNO 38	VRBL*SERC*FXW***STAN. ERROR OF REG. COEFF. SC 15D
ATTNO 31	VRBL*LIMI12*FXW***NUMBER OF RANGE VALUES
ATTNO 18	VRBL*MTEMP*FXW***TEMPORARY STORAGE
ATTNO 39	VRBL*SEE*FXW***STAN. ERROR OF ESTIMATE SC 15D
ATTNO 22	VRBL*LIMIT*FXW***TOTAL NUMBER OF POINTS(RANG + PROP)
ATTN	VRBL*ASUMR1*FXW***SUM OF RANGES
ATTN	VRBL*QSUMR1*FXW***SUM OF RANGES
ATTNO 40	END-LOC-00
ATTNO 41	ATTNL PROCEDURE*ATTENLOSS
ATTNO 42	ENT*B1*0***INITIALIZE
ATTNO 43	ENT*Q*0***INITIALIZE
ATTNO 44	MSTART STR*Q*W(SUMR+B1)***INITIALIZE SUMR
ATTNO 45	BSK*B1*30***INITIALIZE OTHER VARIABLES
ATTNO 46	JP*MSTART
ATTNO 47	ENT*B2*0***INITIALIZE
ATTN 48	RPL*Y-1*W(LIMIT)
ATTN 49	MSTART1 RPL*Y+1*W(NOP)
ATTN 50	ENT*Q*W(RANGE+B1)*QPOS
ATTN 5005	CP*Q
ATTN 5010	STR*G*A*AZERO
ATTN 5015	JF*MBACK
ATTN 5022	ENT*B1*1+B1
ATTN 5020	RPL*Y-1*W(NOP)
ATTN 5025	JP*MNG
ATTNO 0051	MBACK ENT*A*0
ATTNO 005105	LSH*G*3
ATTNO 005110	DIV*12
ATTN 52	STR*Q*W(RANGE1+B2)
ATTNO 53	ADD*Q*W(SUMR)***OBTAIN SUMR
ATTNO 54	STR*Q*W(SUMR)***STORE
ATTN 55	ENT*Q*W(RANGE1+B2)
ATTN 56	MUL*W(RANGE1+B2)

ATTNO 57 LSH*AQ*30'''SET OCTAL PT. BET. A AND Q REGISTERS
ATTNO 58 RJP*FIXFLT'''RANGE SQUARED IN FLOATING POINT REG.
ATTNO 59 ENT*A*W(ASUMR2)'''ENTER SUM RANGE SQUARED
ATTNO 60 ENT*Q*W(QSUMR2)
ATTNO 61 RJP*FLAD'''SUM R SQUARED IN FLT PT REGISTER
ATTNO 62 RJP*FLSTR'''RESTORE R SQUARED TO A AND Q REGISTERS
ATTNO 63 STR*A*W(ASUMR2)'''STORE PARTS
ATTNO 64 STR*Q*W(QSUMR2)
ATTN 65 ENT*Q*W(RANGE1+B2)
ATTNO 66 LSH*Q*14'''SET UP FOR CONLOGIT
ATTNO 67 CONLOGIT'''INPUT SC 15D
ATTNO 68 STR*Q*W(MTEMP)'''STORE TEMPORARILY DB VALUE SC 3
ATTNO 69 ENT*Q*W(RANGE1+B1)'''PROP LOSS VALUE SC 3
ATTNO 70 SUB*Q*W(MTEMP)'''NW=1OLOGR SC 3 IN DB
ATTN 71 MUL*W(RANGE1+B2)
ATTNO 72 LSH*AQ*30'''SET OCTAL PT BET A AND Q REGISTERS
ATTNO 73 RJP*FIXFLT'''CONVERT R(NW=1OLOGR) GO FLT PT
ATTNO 74 ENT*A*W(ASUMRNW)'''SUM VALUES TO A AND Q
ATTNO 75 ENT*Q*W(QSUMRNW)
ATTNO076 RJP*FLAD'''COMPUTE SUMR(NW=1OLOGR) IN FLT PT
ATTNO077 RJP*FLSTR'''SET VALUE TO A AND Q REGISTER
ATTNO078 STR*A*W(ASUMRNW)'''STORE PARTS
ATTNO079 STR*Q*W(QSUMRNW)
ATTNO080 ENT*Q*W(RANGE1+B1)'''PROP LOSS SC 3 IN DB
ATTNO081 SUB*G*W(MTEMP)
ATTN 82 STR*Q*W(ADJPRO+B2)
ATTNO083 ADD*Q*W(NW)'''SUM VALUES
ATTNO084 STR*Q*W(NW)'''SUM(NW=1OLOGR)
ATTNO085 ENT*B2*1+B2'''INCREMENT COUNTER
ATTN 86 ENT*B1*1+B1
ATTN 87 MNG BSK*B1*W(LIMIT)
ATTNO088 JP*MSTART1'''NO
ATTNO089 ENT*Q*W(SUMR)'''YES,CONTINUE
ATTNO08905 CL*A
ATTN 90 LSH*AQ*33
ATTN 91 RJP*FIXFLT
ATTN 92 RJP*FLSTR
ATTN 93 RJP*FLMP
ATTN 9305 RJP*FLSTR
ATTNO094 STR*A*W(ASUMR)'''STORE PARTS
ATTNO095 STR*Q*W(QSUMR)
ATTNO096 ENT*A*0'''INITIALIZE
ATTNO097 ENT*Q*W(NOP)'''TOTAL RANGE VALUES SC 0
ATTNO098 LSH*AQ*36'''SET OCTAL PT BET A AND Q REGISTERS
ATTNO099 RJP*FIXFLT'''CONVERT N TO FLT PT
ATTNO100 ENT*A*W(ASUMR2)'''SUMR(SQUARED) IN FLT PT
ATTNO101 ENT*Q*W(QSUMR2)
ATTNO102 RJP*FLMP'''NSUMR(SQ.) IN FLT PT
ATTNO103 ENT*A*W(ASUMR)'''(SUMR)SQUARED IN FLT PT
ATTNO104 ENT*Q*W(QSUMR)
ATTNO105 RJP*FLSB'''NSUMR(SQ.)-(SUMR)SQ. IN FLT PT
ATTNO106 RJP*FLSTR'''SET TO A AND Q
ATTNO107 STR*A*W(ADVISOR)'''STORE PARTS
ATTNO108 STR*Q*W(QDIVISOR)
ATTNO109 ENT*A*0'''INITIALIZE
ATTNO110 ENT*G*W(NOP)'''TOTAL NUMBER OF RANGE VALUES SC 0
ATTNO111 LSH*AQ*36'''SET OCTAL PT BET A AND Q REGISTERS
ATTNO112 RJP*FIXFLT'''CONVERT TO FLT PT

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ATTNU113 RJP*FLSTR***SET TO A AND Q
ATTNO114 STR*A*W(ANOP)***STORE PARTS
ATTNO115 STR*Q*W(QNOP)
ATTNO116 CL*A
ATTNU117 ENT*Q*W(SUMR)
ATTNU118 LSH*AQ*33
ATTNO119 RJP*FIXFLT
ATTNO120 RJP*FLSTR
ATTNO1205 STR*A*W(ASUMR1)
ATTNO12010 STR*Q*W(QSUMR1)
ATTNO12015 CL*A
ATTNO12020 ENT*Q*W(NW)
ATTNO12025 LSH*AQ*33
ATTNO12030 RJP*FIXFLT
ATTNO12035 ENT*Q*W(QSUMR1)
ATTNO12040 ENT*A*W(ASUMR1)
ATTN 12045 RJP*FLMP
ATTN 12050 RJP*FLSTR
ATTNO121 STR*A*W(ASUBT)***STORE PARTS
ATTNO122 STR*Q*W(QSUBT)
ATTNO123 ENT*Q*W(QNOP)***TOTAL NUMBER OF RANGE PTS IN FLT PT
ATTNO124 ENT*A*W(ANOP)
ATTNO125 RJP*FLENT***SET IN FLT PT REGISTER
ATTNO126 ENT*A*W(ASUMRNW)***SET NSUMR(NW-10LOGR) TO A AND Q
ATTNO127 ENT*Q*W(QSUMRNW)
ATTNO128 RJP*FLMP***NSUMR(NW-10LOGR) IN FLT PT REGISTER
ATTNO129 ENT*A*W(ASUBT)***SET SUMRSUM(NW-10LOGR) TO A AND Q
ATTNO130 ENT*Q*W(QSUBT)
ATTNO131 RJP*FLSB***NSUMR(NW-10LOGR)-SUMRSUM(NW-10LOGR) IN FP
ATTNO132 ENT*A*W(ADVISOR)***NSUMR(SQ.)-(SUMR)SQ.
ATTNO133 ENT*Q*W(QDIVISOR)
ATTNO134 RJP*FLDV***ATTEN COEFF IN FLT PT REGISTER
ATTNO135 RJP*FLTFIX***SET VALUE TO A AND Q SC 300
ATTNO136 RSH*AQ*17***ATTEN COEFF SC 150 SET IN Q
ATTNO137 STR*Q*W(COEFF)***STORE
ATTNO138 ENT*A*0***INITIALIZE
ATTNO139 ENT*Q*W(SUMR)
ATTNO140 LSH*AQ*33***SET OCTAL PT
ATTNO141 RJP*FIXFLT***CONVERT TO FLT PT
ATTNO142 ENT*A*W(ASUMRNW)***SUMR(NW-10LOGR) TO A AND Q
ATTNO143 ENT*Q*W(QSUMRNW)
ATTNO144 RJP*FLMP***SUMRSUMR(NW-10LOGR)
ATTNO145 RJP*FLSTR***SET TO A AND Q
ATTNO146 STR*Q*W(QRRNW)***STORE PARTS
ATTNO147 STR*A*W(ARRNW)
ATTNO148 ENT*A*0***INITIALIZE
ATTNO149 ENT*Q*W(NW)***SUM(NW-10LOGR)
ATTNO150 LSH*AQ*33***SET OCTAL PT
ATTNO151 RJP*FIXFLT***CONVERT TO FLT PT
ATTNO152 ENT*Q*W(QSUMR2)***SUMR(SQ.) IN FLT PT TO A AND Q
ATTNO153 ENT*A*W(ASUMR2)
ATTNO154 RJP*FLMP***SUMR(SQ.)SUM(NW-10LOGR) IN FLT PT
ATTNO155 ENT*A*W(ARRNW)***SUMRSUMR(NW-10LOGR)
ATTNO156 ENT*Q*W(QRRNW)
ATTNO157 RJP*FLSB***SUMR(SQ)SUM(NW-10LOGR)-SUMRSUMR(NW-10LOGR)
ATTNO158 ENT*A*W(ADVISOR)***INSUMR(SQ)-(SUMR)SQ
ATTNO159 ENT*Q*W(QDIVISOR)
ATTNO160 RJP*FLDV***TRANSITION RANGE IN FLT PT REGISTER

ATTN0161 RJP*FLTFIX'''CONVERT TO FIXED POINT SC 30D
ATTN0162 RSH*AQ*25'''TRANS. RANGE SC 9
ATTN0163 STR*Q*W(INTERCEPT)'''STORE
ATTN0164 STR*B0*W(DIF)'''INITIALIZE
ATTN0165 RPL*Y+1*W(LIMIT)'''RESTORE VALUE
ATTN0166 STR*A*Q
ATTN0167 ENT*A*0'''INITIALIZE
ATTN0168 DIV*2
ATTN0169 STR*Q*W(LIMIT2)'''STORE
ATTN0170 RPL*Y-1*W(LIMIT2)'''SET BSK VALUE
ATTN 171 ENT*B2*0
ATTN 172 LIM ENT*Q*W(RANGE1+B2)
ATTN0173 MUL*W(COEFF)'''PREDICTED AR SC 180
ATTN 174 RSH*AQ*90
ATTN0175 ADD*Q*W(INTERCEPT)'''AR+H SC 9 (PREDICTED)
ATTN0176 RSH*Q*6'''AR+H SC 3
ATTN 177 ENT*A*W(ADJPRO+B2)
ATTN0178 STR*A-Q*Q'''DIF
ATTN 179 STR*Q*W(MTEMP)
ATTN 17905 MUL*W(MTEMP)
ATTN0180 ADD*Q*W(DIF)'''SUM VALUES
ATTN0181 STR*Q*W(DIF)'''STORE SC 6
ATTN0182 BSK*B1*W(LIMIT2)'''COMPLETE SUM
ATTN0183 JP*LIM'''NO
ATTN0184 ENT*A*W(LIMIT2)
ATTN0185 SUB*A*1'''N-2
ATTN0186 ENT*Q*W(DIF)
ATTN0187 STR*A*W(MTEMP)'''TEM. STORE N-2
ATTN0188 ENT*A*0'''PREPARE TO DIVIDE
ATTN0189 LSH*AQ*150
ATTN0190 DIV*W(MTEMP)'''DIF/N-2 SC 180
ATTN0191 STR*Q*W(SYN)
ATTN0192 SORT
ATTN0193 STR*Q*W(SEE)'''STAN. ERROR OF ESTIMATE SC 9
ATTN0194 ENT*A*W(ASUMR2)
ATTN0195 ENT*Q*W(QSUMR2)
ATTN0196 RJP*FLENT
ATTN0197 RJP*FLTFIX
ATTN019705 RSH*AQ*300
ATTN019710 SQRT
ATTN019715 STR*Q*W(MTEMP)
ATTN019720 ENT*Q*W(SYN)
ATTN019725 ENT*A*0
ATTN019730 DIV*W(MTEMP)
ATTN0198 SORT
ATTN0199 STR*Q*W(SERC)'''STAN. ERROR OF REG. COEFF. SC 150
ATTN0200 RETURN
ATTN0201 RANGE RESERVE*10000
ATTN0202 RANGE1 RESERVE*5000
ATTN0203 ADJPRO RESERVE*5000
ATTN0204 END-PROC-ATTENLOSS